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EXAMINER	
GREENE, JASON M	
ART UNIT	PAPER NUMBER
1724	

8

DATE MAILED: 08/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

MS

Office Action Summary	Application No.	Applicant(s)
	09/871,156	BENSON ET AL.
	Examin r	Art Unit
	Jason M. Greene	1724

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☒ Claim(s) *21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 May 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4,5,6,7* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Specification

2. The disclosure is objected to because of the following informalities: The Serial Number of a U.S. Application intended to be incorporated by reference in page 26, lines 16-17 appears to have been inadvertently omitted. Appropriate correction is required. Applicants' are reminded that no new matter may be introduced into the disclosure in correcting the omission.

3. The incorporation of essential material in the specification by reference to a foreign application or patent, or to a publication is improper. Applicant is required to amend the disclosure to include the material incorporated by reference. The amendment must be accompanied by an affidavit or declaration executed by the applicant, or a practitioner representing the applicant, stating that the amendatory material consists of the same material incorporated by reference in the referencing

application. See *In re Hawkins*, 486 F.2d 569, 179 USPQ 157 (CCPA 1973); *In re Hawkins*, 486 F.2d 579, 179 USPQ 163 (CCPA 1973); and *In re Hawkins*, 486 F.2d 577, 179 USPQ 167 (CCPA 1973). Since ASTM-1215-89 is recited in claims 1, 11, and 25, the test method is seen as being essential material.

Claim Objections

4. Claim 21 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 21 recites the limitation “wherein the particulate comprises a solid particulate, a liquid particulate or mixtures thereof”. Since this limitation is also recited in claim 11, claim 21 does not further limit the subject matter of claim 11.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 4, 14, and 28 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. While the Specification teaches the fine fiber being selected such that it retains greater than 50 percent of the fiber unchanged for filtration purposes after being submerged in hot water for a significant period of time in page 14, lines 8-18, the Specification does not disclose the fine fiber retaining greater than 50 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

7. Claims 10 and 35 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification does not disclose the substrate layer having an efficiency greater than the efficiency of a single sided media or having a lifetime of about 3 inches H_2O at test conditions of 10 ft/min. The Examiner suggests changing the term “substrate” in line 3 to read as “filter media”.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 1, 4, 11, 14, 25, 26, 28, and 30-34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

10. Regarding claims 1, 4, 11, 14, 25, and 28, the phrase "sheet-like" renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by "sheet-like"), thereby rendering the scope of the claim(s) unascertainable. See MPEP § 2173.05(d).

11. Claim 11 recites the limitation "the filter structure" in line 5. There is insufficient antecedent basis for this limitation in the claim.

12. Claim 26 recites the limitations “the fine fiber layer on the first surface” and “the fine fiber layer on the second surface”. However, since the filter structure comprises at least 3 layers of fine fibers, one of the two surfaces must have at least 2 separate layers of fine fibers. Therefore, it is unclear which layers are encompassed by the limitations.

13. Claims 30-34 recite the limitation “both layers”. However, since the filter structure comprises at least 3 layers of fine fibers, it is unclear which layers are encompassed by the limitation.

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

15. Claims 1-3, 5-8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399.

With regard to claim 1, Kahlbaugh et al. '399 discloses a fine fiber filter media comprising a sheet-like filter substrate (14), the sheet having a first surface and a second surface, the first surface and the second surface each comprising a layer (15,19) of fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, the fine fiber formed in an amount effective to obtain an overall efficiency under ASTM 1215-89 with monodispersed 0.78 micron polystyrene latex particles at 20 ft/min velocity of between 50 and 90 percent in any one layer in Fig. 7, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 16, lines 34-55, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the fine fiber having a diameter of about 0.001 to 0.5 microns, the layer having a thickness of less than 5 microns, and the efficiency of each layer being less than 90 percent, these limitations are anticipated.

With regard to claim 2, Kahlbaugh et al. '399 discloses the efficiency of the fine fiber layer on the first surface being different than the efficiency of the fine fiber layer on the second surface in col. 6, lines 4-16 and col. 24, lines 38-56.

With regard to claim 3, Kahlbaugh et al. '399 discloses the efficiency of the fine fiber layer on a downstream surface being greater than the efficiency of the fine filter layer on an upstream surface in col. 24, lines 38-56.

With regard to claim 5, Kahlbaugh et al. '399 discloses the fine fiber being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90

percent and the substrate having an efficiency of 10 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be $1 - (1-0.7)*(1-0.7) = 0.91 = 91$ percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being less than 85 percent and the efficiency of the substrate being about 5 percent to about 80 percent, these limitations are anticipated.

With regard to claims 6 and 8, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 65 percent or the substrate having an efficiency of about 20 percent to about 80 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to increase the efficiency of the substrate to increase the efficiency of the filter media to reduce the amount of particulate matter passing through the filter media.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being less than 80 percent and about 40 percent to 80 percent, these limitations are anticipated.

With regard to claim 7, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in, col. 4, line 12 to col. 5, line 23,

col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 65 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being 40 percent to 85 percent and the efficiency of the substrate being about 5 percent to about 80 percent, these limitations are anticipated.

With regard to claim 10, Kahlbaugh et al. '399 discloses the filter media having an efficiency greater than the efficiency of a single sided media in Fig. 7, col. 14, lines 1-14, col. 24, lines 38-56, and col. 27, lines 36-55. The term single sided media has been taken to mean a filter media having a fine fiber layer on only one surface of a substrate.

Kahlbaugh et al '399 does not disclose the fine fiber forming an interlocking mesh of fiber having on the average a pore size between fibers in the web of less than about

3 microns, wherein the filter media has a lifetime, defined as an increase in pressure drop over the filter of about 3 inches H_2O at test conditions of 10 ft/min.

Kahlbaugh et al. '399 teaches the filter media having a lifetime between 2 and 5 inches H_2O at test conditions of 10 ft/min in col. 33, lines 54-57.

Since the prior art range is seen as overlapping the disclosed range of about 3 inches H_2O, a prima facie case of obviousness exists which must be overcome through a showing of unobvious or unexpected results.

Kahlbaugh et al. '399 teaches adjusting the average pore size between adjacent fibers in the web to adjust the efficiency of the layer in page 32, lines 9-63.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the average pore size between fibers in the web to below about 3 microns to provide a layer having a desired efficiency for a desired application.

16. Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399 in view of Sekiya et al.

With regard to claim 4, Kahlbaugh et al. '399 discloses the sheet-like substrate having a thickness of 0.01 inches (0.254 mm), the first surface and the second surface each comprising a layer of fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, and the fine fiber being polycarbonate in Fig. 7, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 15,

lines 6-18, col. 16, lines 34-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 50 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile, polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh et al '399 both teach the fine fiber layer being formed from the same material, the fine fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the substrate having a thickness of about 0.1 to 3 millimeters, the fine fiber having a diameter of about 0.01 to 0.3 microns, and the fine fiber layer having a thickness of less than 3 microns, these limitations are anticipated.

With regard to claim 9, Kahlbaugh et al. '399 discloses the fine fiber layer being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the fine fiber being polycarbonate in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 18, col. 16, lines 56-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 80 percent or the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Since Kahlbaugh et al. teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be $1 - (1-0.7)*(1-0.7) = 0.91 = 91$ percent.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 30 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile, polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh et al '399 both teach the fine fiber layer being formed from the same material, the fine fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges the efficiency of each fine fiber layer being less than 75 percent, this limitations are anticipated.

17. Claims 11-13, 15-18, and 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399.

With regard to claims 11 and 21, Kahlbaugh et al. '399 discloses a method of removing a particulate from an air borne stream, the particulate comprising a liquid particulate, a solid particulate, or mixtures thereof, the method comprising placing a filter structure in an air stream and directing the air stream through the filter structure while monitoring the useful life of the filter structure, said filter structure comprising a fine fiber filter media and sheet-like filter substrate (14), the sheet-like filter substrate having a first surface and a second surface, the first surface and the second surface each comprising a layer (15,19) of fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, the fine fiber formed in an amount effective to obtain an overall efficiency under ASTM 1215-89 with monodispersed 0.78 micron polystyrene latex particles at 20 ft/min velocity of between 50 and 90 percent in any one layer in Figs. 7 and 25, col. 1, lines 5-33, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 16, lines 34-55, col. 22, line 55 to col. 23, line 32, col. 27, lines 36-55, and col. 33, lines 35-57.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28,

the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the fine fiber having a diameter of about 0.001 to 0.5 microns, the layer having a thickness of less than 5 microns, and the efficiency of each layer being less than 90 percent, these limitations are anticipated.

With regard to claim 12, Kahlbaugh et al. '399 discloses the efficiency of the fine fiber layer on the first surface being different than the efficiency of the fine fiber layer on the second surface in col. 6, lines 4-16 and col. 24, lines 38-56.

With regard to claim 13, Kahlbaugh et al. '399 discloses the efficiency of the fine fiber layer on a downstream surface being greater than the efficiency of the fine filter layer on an upstream surface in col. 24, lines 38-56.

With regard to claim 15, Kahlbaugh et al. '399 discloses the fine fiber being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being less than 85 percent and the efficiency of the substrate being about 5 percent to about 80 percent, these limitations are anticipated.

With regard to claims 16 and 18, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 65 percent or the substrate having an efficiency of about 20 percent to about 80 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the

time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to increase the efficiency of the substrate to increase the efficiency of the filter media to reduce the amount of particulate matter passing through the filter media.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being less than 80 percent and about 40 percent to 80 percent, these limitations are anticipated.

With regard to claim 17, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in, col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 65 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the

time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7) = 0.91 = 91 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being 40 percent to 85 percent and the efficiency of the substrate being about 5 percent to about 80 percent, these limitations are anticipated.

With regard to claim 20, Kahlbaugh et al. '399 discloses the filter media having an efficiency greater than the efficiency of a single sided media in Fig. 7, col. 14, lines 1-14, col. 24, lines 38-56, and col. 27, lines 36-55. The term single sided media has been taken to mean a filter media having a fine fiber layer on only one surface of a substrate.

Kahlbaugh et al '399 does not disclose the fine fiber forming an interlocking mesh of fiber having on the average a pore size between fibers in the web of less than about 3 microns, wherein the filter media has a lifetime, defined as an increase in pressure drop over the filter of about 3 inches H_2O at test conditions of 10 ft/min.

Kahlbaugh et al. '399 teaches the filter media having a lifetime between 2 and 5 inches H_2O at test conditions of 10 ft/min in col. 33, lines 54-57.

Since the prior art range is seen as overlapping the disclosed range of about 3 inches H_2O, a prima facie case of obviousness exists which must be overcome through a showing of unobvious or unexpected results.

Kahlbaugh et al. '399 teaches adjusting the average pore size between adjacent fibers in the web to adjust the efficiency of the layer in page 32, lines 9-63.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the average pore size between fibers in the web to below about 3 microns to provide a layer having a desired efficiency for a desired application.

With regard to claim 22, Kahlbaugh et al. '399 discloses the particulate comprising residual components of combustion in col. 1, lines 28-33.

With regard to claim 23, Kahlbaugh et al. '399 discloses the particulate comprising a fatty oil in col. 32, lines 16-19.

With regard to claim 24, Kahlbaugh et al. '399 discloses the particulate comprising soot and grit in col. 1, lines 14-33. The soot is seen as being the exhaust from an engine, such as a diesel engine and the grit is seen as being particulate matter in the intake air stream of an engine.

18. Claims 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399 in view of Sekiya et al.

With regard to claim 14, Kahlbaugh et al. '399 discloses the sheet-like substrate having a thickness of 0.01 inches (0.254 mm), the first surface and the second surface each comprising a layer of fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, and the fine fiber being polycarbonate in Fig. 7, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 15, lines 6-18, col. 16, lines 34-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 50 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile,

polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh et al '399 both teach the fine fiber layer being formed from the same material, the fine fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the substrate having a thickness of about 0.1 to 3 millimeters, the fine fiber having a diameter of about 0.01 to 0.3 microns, and the fine fiber layer having a thickness of less than 3 microns, these limitations are anticipated.

With regard to claim 19, Kahlbaugh et al. '399 discloses the fine fiber layer being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the fine fiber being polycarbonate in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 18, col. 16, lines 56-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 80 percent or the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Since Kahlbaugh et al. teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be $1 - (1-0.7)*(1-0.7) = 0.91 = 91$ percent.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 30 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile, polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh et al '399 both teach the fine fiber layer being formed from the same material, the fine

fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing a specific example lying within the claimed range of the efficiency of each fine fiber layer being less than 75 percent, this limitation is anticipated.

19. Claims 25-27, 29-33, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399.

With regard to claim 25, Kahlbaugh et al. '399 discloses a filter structure comprising one or more sheet-like filter substrate (14,18,21) and three or more layers of fine fiber, each sheet having a first surface and a second surface, the surfaces comprising three or more layers of the fine fiber on the substrate, each layer comprising fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, the fine fiber formed in an amount effective to obtain an overall efficiency under ASTM 1215-89 with monodispersed 0.78 micron polystyrene latex particles at 20 ft/min velocity of between 50 and 90 percent in any one layer in Fig. 7, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 16, lines 34-55, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55. Kahlbaugh et al. '399 discloses a filter being formed by applying a fine fiber layer to a first and second side of a substrate in col. 27, lines 38-45. Kahlbaugh et al. '399 further discloses the filter structure being formed by joining two of the filters together such that two fine fiber layers are adjacent

one another on each side of the substrate in col. 27, lines 52-55. Therefore, the filter structure is seen as comprising a substrate having 4 layers (2 on each side) of fine fibers on the surfaces of the substrate.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of the layers of fine fibers being greater than 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7)*(1-0.7)*(1-0.7) = 0.9919 = 99.19 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the fine fiber having a diameter of about 0.001 to 0.5 microns, the layer having a thickness of less than 5 microns, and the efficiency of each layer being less than 90 percent, these limitations are anticipated.

With regard to claim 26, Kahlbaugh et al. '399 discloses the efficiency of a fine fiber layer on the first surface being different than the efficiency of a fine fiber layer on the second surface in col. 6, lines 4-16 and col. 24, lines 38-56.

With regard to claim 27, Kahlbaugh et al. '399 discloses the efficiency of a fine fiber layer on a downstream surface being greater than the efficiency of a fine filter layer on an upstream surface in col. 24, lines 38-56.

With regard to claim 29, Kahlbaugh et al. '399 discloses the sheet-like substrate having a thickness of 0.03 inches (0.762 mm) in col. 15, lines 6-28.

Since the prior art is seen as disclosing a specific example lying within the claimed range of about 0.3 to 1 millimeter, this limitation is anticipated.

With regard to claims 30 and 31, Kahlbaugh et al. '399 discloses the fine fiber being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of the layers of fine fibers being greater than 85 or 90 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7)(1-0.7)*(1-.07) = 0.9919 = 99.19 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being less than 80 and 85 percent, these limitations are anticipated.

With regard to claim 32, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in, col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of the layers of fine fibers being greater than 65 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7)*(1-0.7)*(1-0.7)= 0.9919 = 99.19 percent.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the efficiency of each fine fiber layer being 40 percent to 85 percent and the efficiency of the substrate being about 5 percent to about 80 percent, these limitations are anticipated.

With regard to claim 33, Kahlbaugh et al. '399 discloses the fine fiber formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the substrate having an efficiency of 10 percent in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 6, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the combined efficiency of the layers of fine fibers being greater than 65 percent or the substrate having an efficiency of about 20 percent to about 80 percent.

Since Kahlbaugh et al. '399 teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be 1 - (1-0.7)*(1-0.7)*(1-0.7)*(1-0.7) = 0.9911 = 99.19 percent.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to increase the efficiency of the substrate to increase the efficiency of the filter media to reduce the amount of particulate matter passing through the filter media.

Since the prior art is seen as disclosing a specific example lying within the claimed range of the efficiency of each fine fiber layer being about 40 percent to 80 percent, this limitation is anticipated.

With regard to claim 35, Kahlbaugh et al. '399 discloses the filter media having an efficiency greater than the efficiency of a single sided media in Fig. 7, col. 14, lines 1-14, col. 24, lines 38-56, and col. 27, lines 36-55. The term single sided media has been taken to mean a filter media having a fine fiber layer on only one surface of a substrate.

Kahlbaugh et al '399 does not disclose the fine fiber forming an interlocking mesh of fiber having on the average a pore size between fibers in the web of less than about 3 microns, wherein the filter media has a lifetime, defined as an increase in pressure drop over the filter of about 3 inches H_2O at test conditions of 10 ft/min.

Kahlbaugh et al. '399 teaches the filter media having a lifetime between 2 and 5 inches H_2O at test conditions of 10 ft/min in col. 33, lines 54-57.

Since the prior art range is seen as overlapping the disclosed range of about 3 inches H_2O, a prima facie case of obviousness exists which must be overcome through a showing of unobvious or unexpected results.

Kahlbaugh et al. '399 teaches adjusting the average pore size between adjacent fibers in the web to adjust the efficiency of the layer in page 32, lines 9-63.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the average pore size between fibers in the web to below about 3 microns to provide a layer having a desired efficiency for a desired application.

20. Claims 28 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kahlbaugh et al. '399 in view of Sekiya et al.

With regard to claim 28, Kahlbaugh et al. '399 discloses the sheet-like substrate having a thickness of 0.01 inches (0.254 mm), the first surface and the second surface each comprising a layer of fine fiber having a diameter of 0.1 microns, the layer having a thickness of 2 microns, and the fine fiber being polycarbonate in Fig. 7, col. 3, lines 27-64, col. 4, line 12 to col. 5, line 23, col. 12, lines 38-47, col. 14, lines 1-14, col. 15, lines 6-18, col. 16, lines 34-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. '399 does not explicitly disclose the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 50 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile, polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh et al '399 both teach the fine fiber layer being formed from the same material, the fine fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing specific examples lying within the claimed ranges of the substrate having a thickness of about 0.1 to 3 millimeters, the fine fiber having a diameter of about 0.01 to 0.3 microns, and the fine fiber layer having a thickness of less than 3 microns, these limitations are anticipated.

With regard to claim 34, Kahlbaugh et al. '399 discloses the fine fiber layer being formed in an amount effective, in each layer, to obtain an efficiency of between 50 and 90 percent and the fine fiber being polycarbonate in col. 4, line 12 to col. 5, line 23, col. 14, line 60 to col. 15, line 18, col. 16, lines 56-64, col. 22, line 55 to col. 23, line 32, and col. 27, lines 36-55.

Kahlbaugh et al. does not explicitly disclose the combined efficiency of both layers of fine fibers being greater than 80 percent or the fine fiber being selected such that after test exposure for a test period of 16 hours to test conditions of 140 ^{0}F and a

relative humidity of 100 percent retains greater than 50 percent of the fiber unchanged for filtration purposes.

Since Kahlbaugh et al. teaches the efficiency in any one layer being between 50 and 90 percent in col. 4, lines 12-61, one of ordinary skill in the art at the time the invention was made would have recognized that each layer could have been selected to have an efficiency of 70 percent to provide a filter media for a particular application. Using the equation provided by Kahlbaugh et al. '399 in col. 23, lines 26-28, the efficiency of two layers each having an efficiency of 70 percent can be calculated to be $1 - (1-0.7)*(1-0.7)*(1-0.7)*(1-0.7) = 0.9919 = 99.19$ percent.

Sekiya et al. teaches polycarbonate having excellent thermal and humidity resistance in col. 9, lines 20-22.

Since polycarbonate exhibits excellent thermal and humidity resistance, one of ordinary skill in the art at the time the invention was made would have expected fine fibers formed from polycarbonate to retain greater than 30 percent of the fiber unchanged for filtration purposes after being exposed to air having a temperature of 140 ^{0}F and 100 percent relative humidity for 16 hours.

Furthermore, both Applicants and Kahlbaugh et al '399 disclose forming the fine fiber layer of the same materials. Specifically, Applicants teach forming the fine fiber layer from polypropylene, polyvinyl chloride (PVC), cellulose ester, polyacrylonitrile, polyamides, polystyrene, polyvinylidene fluoride, polyvinylidene chloride, or nylon in page 15, line 30 to page 18, line 19. Kahlbaugh et al. '399 teaches forming the fine fibers from identical materials in page 16, lines 53-64. Since Applicants and Kahlbaugh

et al '399 both teach the fine fiber layer being formed from the same material, the fine fibers of Kahlbaugh et al. '399 would inherently have the same heat and humidity resistance properties as the fine fibers of the present invention.

Since the prior art is seen as disclosing a specific example lying within the claimed range of the efficiency of each fine fiber layer being less than 75 percent, this limitation is anticipated.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The Choi, Cusick et al., Midkiff, Sorvari et al., Schultink et al., Zhang, and Bosses references disclose similar filter media.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Greene whose telephone number is (703) 308-6240. The examiner can normally be reached on Tuesday - Friday (7:00 AM to 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Simmons can be reached on (703) 308-1972. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jason M. Greene
Examiner
Art Unit 1724

David A. Simmons
Supervisory Patent Examiner
Technology Center 1700

jmg
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